

Biological Evaluation of Ash Trees at Tionesta Lake and Dam



Prepared By:

Richard M. Turcotte
Entomologist

Tara Spinos
Biological Science Technician
&

Daniel Walton
Pathways Student Intern
USDA Forest Service
Northeastern Area State and Private Forestry
Forest Health Protection
180 Canfield Street
Morgantown, WV 26505

Prepared For:

U.S. Army Corps of Engineers
Tionesta Lake
Forest County, Pennsylvania
October 2013
(NA-13-12)

Table of Contents

Abstract.....	1
Purpose and Need	1
Project Location Description	1
Project Objectives	2
<i>ARCMAP data.....</i>	<i>3</i>
<i>Ash survey.....</i>	<i>3</i>
<i>Ash tree debarking</i>	<i>3</i>
Results	4
<i>Ash tree survey.....</i>	<i>4</i>
<i>Ash debarking</i>	<i>4</i>
Management Options.....	5
<i>No action option.....</i>	<i>5</i>
Intervention Option	5
<i>Chemical insecticide option</i>	<i>5</i>
<i>Biological control</i>	<i>6</i>
Alternatives.....	6
Recommendations	6
Species Evaluation	7
References	8

Abstract

During the spring and summer of 2013 personnel from the United States Army Corps of Engineers (COE), and United States Department of Agriculture, Forest Service, Northeastern Area, Forest Health Protection, Morgantown, WV. Field Office conducted a survey to detect emerald ash borer (EAB), *Agrilus planipennis* Fairmaire at the Tionesta Lake and Dam in Forest County, Pennsylvania. The purpose of the survey was to survey for the presence of EAB and determine the need for treatment within the site. Since EAB has been found in at the site, it is recommend that a comprehensive forest management plan be developed and a chemical suppression/prevention treatment plan be put into place to protect high value ash (*Fraxinus* spp.) trees. The release of biological control agents is also recommended as a potential long-term control strategy of EAB.

Purpose and Need

The Morgantown Field Office (MFO) received a request from Jason Quinn, Resource Specialist with the United States Army Corps of Engineers (COE), whose was concerned about declining ash (*Fraxinus* spp.) within the campground area. The Morgantown Field Office addressed the request to investigate Tionesta Lake and Dam for signs or symptoms of the emerald ash borer (EAB), *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae) and identify any significant issues that might occur as a result of borer activity within the site. This project was undertaken by the MFO to address this request and evaluate what management options are available to protect and maintain the ash resources at the Tionesta Lake and Dam.

Project Location Description

Tionesta Lake and Dam (TLD) is located in northwestern Pennsylvania in Forest County (41°28'N, -79°25'W). The project covers approximately 3,100 acres (Figure 1). The project was authorized by an Act of Congress in 1938 as part of a flood damage reduction project in the Pittsburgh District. This project is part of a flood control system for the Allegheny and upper Ohio River system.

Tionesta Lake and Dam lies within the hemlock-white pine-northern hardwood region (Braun 1950). The hemlock-northern hardwood forest type of pre-settlement times was composed mainly of eastern hemlock (*Tsuga canadensis*) and American beech (*Fagus grandifolia*), and it has been replaced by the current mixed upland hardwoods and cherry-maple (Allegheny hardwood) types (Whitney 1990, Morin et al. 2006).

Tionesta Lake and Dam contains over 200 campsites on 125 developed and undeveloped campgrounds. In addition the project has two boat launches, two canoe access sites and 30 miles, of mountain biking, equestrian and hiking trails.

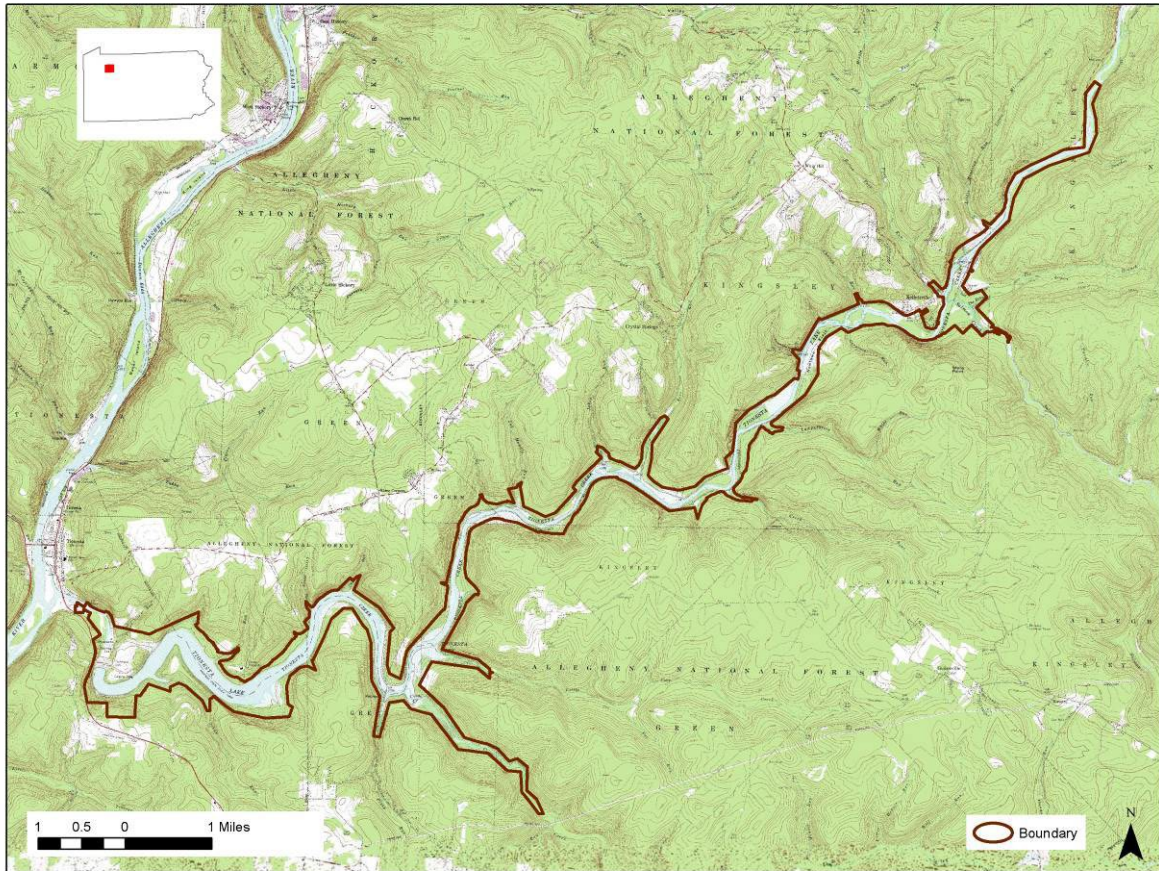


Figure 1. Tionesta Lake and Dam in Northwestern Pennsylvania

Previous projects

The MFO has had a long relationship with the TLD Project, in 1985, 1992 and 2013 this office worked with staff from the project and aerial sprayed 130, 169 and 213 acres respective for gypsy moth control using the microbial insecticide, *Bacillus thuringiensis* variety *kurstaki* (*B.t.k*).

Project Objectives

The objectives for this evaluation were to 1) determine whether or not EAB was present within the site, 2) assess the location and extent of ash within the site and 3) determine the need for ash treatments to protect and maintain the ash resources within the TLD.

Project Methods

ARCMAP data

We used ARCMAP® data provide by U.S. Army Corps of Engineers for the boundary and worked with Project staff to digitize and break the area into blocks based on use (e.g. campgrounds, recreation areas, and general forest; Figure 2). These boundary areas were then overlaid with National Agricultural Imagery Program (NAIP) data and Google earth imagery which was used to digitize tree cover, calculate acreage, and define survey blocks.

Ash survey

In the summer and fall of 2013 an intensive ash inventory of the campground (Figure 2) was conducted by dam staff. All ash trees ≥ 2 inch in diameter at breast height (dbh; 4.5 ft. above the ground; (USDA 2001) were identified, size classed, visual inspected for signs and symptoms of EAB, and its geo-coordinates taken using a handheld GPS unit.

Ash tree debarking

The campground areas were visually assessed, looking for signs of EAB. D-shaped exit holes were found on ash trees throughout the campgrounds. Several ash trees with extensive woodpecker activity was cut down and debarked to look for galleries of EAB.

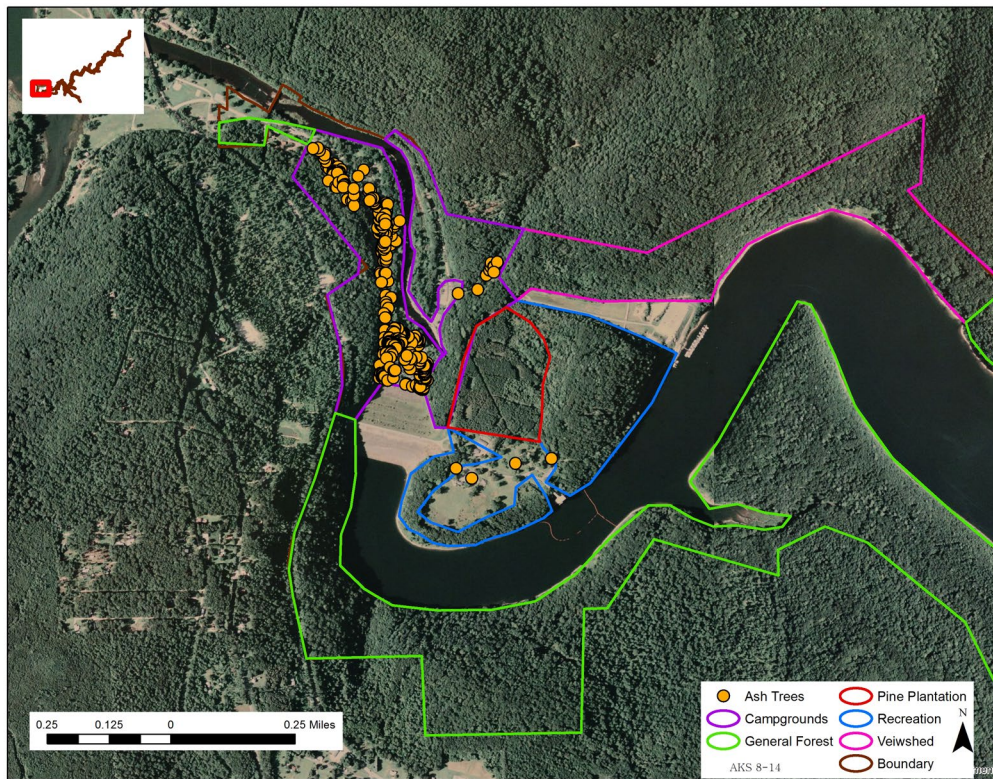


Figure 2. Survey map for ash trees at Tionesta Lake and Dam, Forest County, Pennsylvania.

Results

Ash tree survey

Field surveys identified 409 ash trees within the campground and recreation areas (Figure 2). Of the 409 ash trees inventoried 321 were alive, 71 were dead and another 17 had been removed recently by staff. The average dbh for live ash trees was 11.2 ± 0.32 inches and 8.7 ± 1.2 inches for the dead trees; live trees ranged in size from 2.0 to 54.0 inches dbh (Figure 3). Woodpecker activity was noted on 98 percent of the tallied ash trees and D-shaped exit holes were found on several dead ash trees, which were subsequently removed and burned by COE staff.

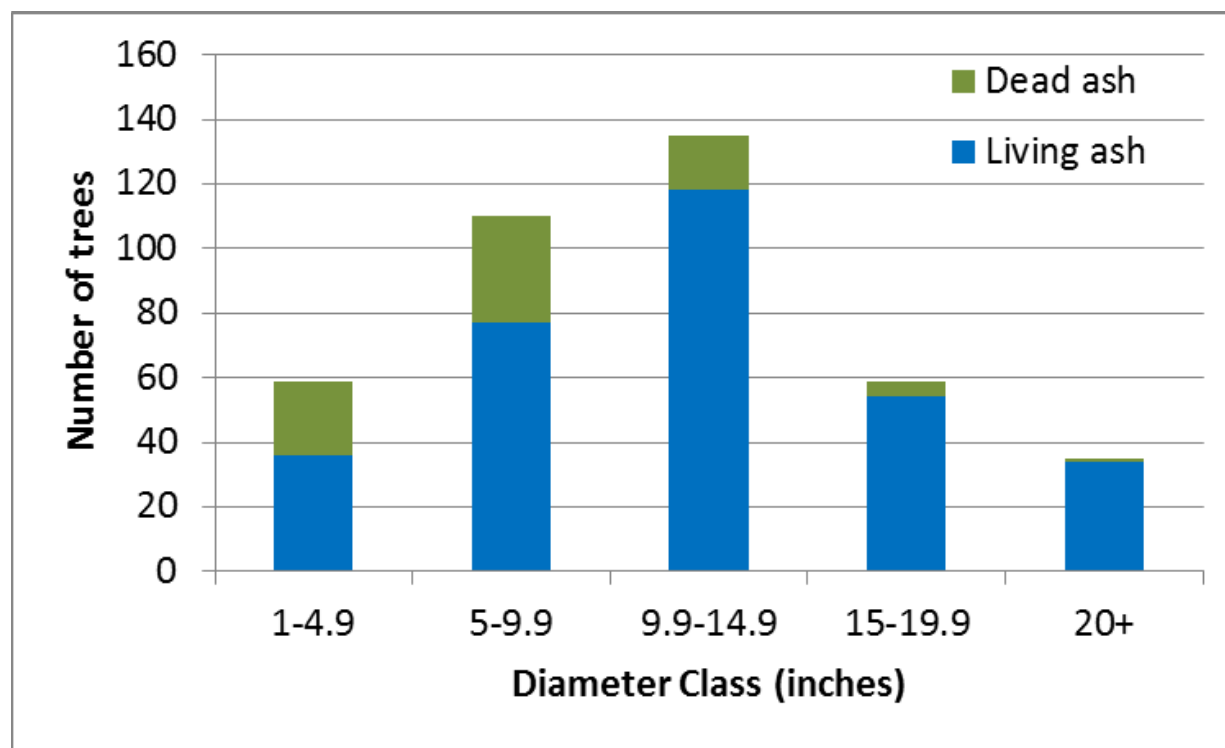


Figure 3. Size distribution of ash within the campground and recreation areas at Tionesta Lake and Dam.

Ash debarking

Several suspect ash tree were felled and debarked all had signs and symptoms consistent with EAB. Larval samples were collected and sent to the Pennsylvania Department of Agriculture on August 1, 2013. Samples were confirmed as EAB by Sven-Erik Spichiger of the Entomology section on August 6, 2013 (ID# 60628). Based on these results and the amount of woodpecker activity present on dead ash trees with the campground it is likely that EAB has been present at the site for a number of years.

Discussion

The main objectives of this evaluation were to determine whether EAB was present, inventory the area, and evaluate the need for EAB management activities. Because EAB is current present

and active at the site it is recommended that the site develop a comprehensive vegetation management plan that includes replanting and treatments to ensure a sustainable forest will continue at TLD.

Management Options

For 2013, three management options have been evaluated for managing EAB at the Tionesta Lake and Dam. The intervention options are offered based on the following objectives: 1) protect high value ash trees; and 2) protect native woodland ash trees. Each option is discussed below.

No action option

In this option emerald ash borer is allowed to infest suscep-

tible ash trees within the site. Should this option be selected, it is likely that all susceptible ash trees would be attacked and die as a result of EAB. This would result in the loss of not only high value trees but native woodland trees which would result in hazard trees in public areas, and a reduction in overstory canopy and soft mast production in these areas.

Intervention Option

Chemical insecticide option

The second and third options are to use chemical insecticides to prevent and control EAB. Chemical control options for EAB were reviewed by (Herms et al. 2009) and include: noninvasive systematic basal trunk sprays, soil-applied systematic insecticides, trunk-injected systematic insecticides, and protective cover sprays. Dinotefuran (Safari®) is labeled for controlling EAB and has shown variable results. It is sprayed on the lower 5 or 6 feet of trunk. Soil injection of imidacloprid has showed variable results and requires careful attention to soil conditions and tree dbh. Soil injections should be applied 2-4 in. below the soil surface to stay available to feeder roots, soil should be moist to facilitate uptake, and chemical amounts should be increased or combined with other treatment methods for trees larger than 15 in. diameter at breast height (dbh). Trunk injection of emamectin benzoate in mid-May or early June provides the most consistent control of EAB, according to test trials at Michigan State and Ohio State Universities. This was the only treatment that provided multiple years of protection (up to three years). Protective cover sprays have been shown to prevent EAB from entering trees in Michigan State University studies, but have no effect on larvae feeding under the bark. Spraying the entire tree is most effective, but there is considerable drift associated with this process. A natural product azadirachtin is also available formulated as TreeAzin™ which has the potential for systemic control of EAB. This product is natural tetranortriterpenoid compound extracted from the seed kernels of the neem, (*Azadirachta indica*)(Fares et al. 1980) and is trunk injected into the tree.

Biological control

Currently, three parasitoid wasps, including two gregarious larval endoparasitoid species, *Spathius agrili* and *Tetrastichus planipennisi* and a solitary parthenogenic egg parasitoid, *Oobius agrili* are available for release against EAB. The release and establishment of EAB natural enemies is not likely to provide any short term control of EAB. This long-term approach is still experimental and will likely require a complex of natural enemies to maintain EAB below damaging levels. It may be years before these parasites can self-perpetuate sufficiently before any level of success can be determined.

Alternatives

Alternative 1.	No action
Alternative 2.	Treat all landscape and campground ash trees and release biological control agents.
Alternative 3.	Limits treatments to all landscape and campground trees > 15 inches diameter at breast height and release biological control agents.

Recommendations

Because EAB is already at infestation level at Tionesta Lake and Dam it is recommended that that a comprehensive ash/forest management plan be developed and a chemical suppression/prevention treatment plan be put into place as soon as possible. In addition it is recommended that a public awareness campaign, be instituted about emerald ash borer.

Alternative two is recommend based on the following considerations.

- 1) Based on high numbers of likely infested ash trees by EAB at the Tioneata Lake and Dam.
- 2) This alterative protects the high value ash and retains large and smaller specimen trees forested areas.
- 3) Release and establishment of available EAB parasitoids is also recommended in infested areas on ash that are not in close proximity to chemical treatments. The establishment of these natural enemies offers the opportunity for long-term control and may minimize the need for repeated chemical treatments in future years.

Species Evaluation

Emerald Ash Borer (EAB) *Agrilus planipennis* (Fairmaire) is a wood-boring beetle from eastern Asia (Poland and McCullough 2006) that is causing severe mortality in North American ash (Tluczek et al. 2011). EAB affects all species and diameter classes of ash and often kills both healthy and stressed trees within three to five years after becoming infested (Siegert et al. 2006). Based on the data from USDA Animal and Plant Health Inspection Service (APHIS), EAB emerge around mid-June and are present through mid-August (www.emeraldashborer.info). Adult beetles are slender, elongate, and bright green and feed on ash foliage in patches along the leaf margins (Kovacs et al. 2010). Adult beetles usually live for about three weeks and females lay about 60-90 eggs (McCullough and Katovich 2004). Eggs hatch in 7-10 days and larvae chew through the bark and feed on phloem and outer sapwood for several weeks, creating S-shaped galleries packed with frass (Bauer et al. 2004). Larvae are white to cream-colored, 10-segmented, and flattened. Larvae overwinter in shallow chambers in the outer sapwood or bark on thick-barked trees (Bauer et al. 2004). EAB pupate in late April or May and adults emerge 1-2 weeks after pupation through D-shaped exit holes (McCullough and Katovich 2004).

In addition to causing severe economic damage, there are ecological consequences associated with the loss of ash from North American forests. Studies show that ash provides food and habitat for several bird and mammal species (Faanes 1984, Rumble and Gobeille 1998). Forty-three native arthropod species are at high risk due to their association with ash for breeding or feeding (Gandhi et al. 2010). In addition, ash contributes to nutrient cycling in hardwood forests (Reiners and Reiners 1970).

References

- Bauer, L. S., R. A. Haack, D. L. Miller, T. R. Petrice, and H. Liu. 2004. Emerald ash borer life cycle. Page P. 8 *in* Proceedings of the emerald ash borer research and technology development meeting. U.S. Forest Service, Forest Health Technology Enterprise Team, Port Huron, MI.
- Braun, E. L. 1950. Deciduous forests of Eastern North America. Blakiston Co., Philadelphia; Toronto.
- Faanes, C. A. 1984. Wooded islands in a sea of prairie. *Am. Birds*:3-6.
- Fares, Y., P. J. H. Sharpe, and C. E. Magnuson. 1980. Pheromone Dispersion in Forests. *J. Theor. Biol.* **84**:335-359.
- Gandhi, K. J. K., A. I. Cognato, D. M. Lightle, B. J. Mosley, D. G. Nielsen, and D. A. Herms. 2010. Species Composition, Seasonal Activity, and Semiochemical Response of Native and Exotic Bark and Ambrosia Beetles (Coleoptera: Curculionidae: Scolytinae) in Northeastern Ohio. *Journal of Economic Entomology* **103**:1187-1195.
- Herms, D. A., D. G. McCullough, D. R. Smitley, C. Sadof, R. C. Williamson, and P. L. Nixon. 2009. Insecticide options for protecting ash trees from emerald ash borer. Ohio State University Extension, Wooster, Ohio.
- Kovacs, K. F., R. G. Haight, D. G. McCullough, R. J. Mercader, N. W. Siegert, and A. M. Liebhold. 2010. Cost of potential emerald ash borer damage in U.S. communities, 2009–2019. *Ecological Economics* **69**:569-578.
- McCullough, D. G. and S. A. Katovich. 2004. Pest Alert: Emerald Ash Borer. *in* U. S. F. S. N. Area, editor.
- Morin, R. S., A. M. Liebhold, K. W. Gottschalk, C. W. Woodall, D. B. Twardus, R. L. White, S. B. Horsley, and R. T.E. 2006. Analysis of forest health monitoring surveys on the Allegheny National Forest (1998-2001). Gen. Tech. Rep. NE-339. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. .
- Poland, T. M. and D. G. McCullough. 2006. Emerald Ash Borer: Invasion of the Urban Forest and the Threat to North Americas Ash Resource. *Journal of Forestry* **104**:118-124.
- Reiners, W. A. and N. M. Reiners. 1970. Energy and Nutrient Dynamics of Forest Floors in Three Minnesota Forests. *Journal of Ecology* **58**:497-519.
- Rumble, M. A. and J. E. Gobeille. 1998. Bird Community Relationships to Succession in Green Ash (*Fraxinus pennsylvanica*) Woodlands. *The American Midland Naturalist* **140**:372-381.
- Siegert, N. W., D. G. McCullough, A. M. Liebhold, and F. W. Telewski. 2006. Spread and dispersal of emerald ash borer: a dendrochronological approach. Page P. 10 *in* Proceedings of the Emerald Ash Borer Research and Technology Development Meeting. U.S. Forest Service, Forest Health Technology Enterprise Team, Pittsburg, Pennsylvania.
- Tluczek, A. R., D. G. McCullough, and T. M. Poland. 2011. Influence of Host Stress on Emerald Ash Borer (Coleoptera: Buprestidae) Adult Density, Development, and Distribution in *Fraxinus pennsylvanica* Trees. *Environmental Entomology* **40**:357-366.

- USDA. 2001. Forest Inventory and Analysis Northeast Field Guide. Page 298 *in* F. S. United States Department of Agriculture, Northeastern Research Station, Forest Inventory and Analysis Unit, editor.
- Whitney, G. G. 1990. The History and Status of the Hemlock-Hardwood Forests of the Allegheny Plateau. *Journal of Ecology* **78**:443-458.